

TECHNOLOGY@ROCKY FLATS

Demonstration & Deployment Summary

Ultra-high Pressure Water Jet Used to Remotely Cut B774 Tank

Summary

Liquids used for processing plutonium at Rocky Flats required hundreds of tanks for storage and treatment. Many of these tanks are so large they had to be installed prior to the completion of the buildings that housed them. Some tanks contain polychlorinated biphenyls (PCBs), others may contain beryllium, and nearly all of them are contaminated with plutonium and americium.

Large tanks, such as the 7,300-gallon New Tank 40 in building 774, are far too large to be removed from the building. To size-reduce New Tank 40, workers would have used nibblers to complete three cuts around the tank's 20-foot circumference. The ultra-high pressure water-jet, manufactured by Jet Edge, instead made the cuts much more quickly and with workers safely staged at a distance.

The Need

Process equipment that is both too large to be moved and will not meet free-release criteria for disposal must be size-reduced in place. A typical in-situ size-reduction requires workers to use nibblers, Sawzalls, and other tools in very close contact with contaminated equipment. These evolutions expose workers to multiple industrial and radiological hazards.

After decontamination, tanks and other equipment are coated with a fixative to adhere contaminants to surfaces. Me-



chanical cutting with Sawzalls or nibblers will break loose fixatives and cause re-suspension of contaminants. Workers are also exposed to cutting hazards that have the potential to breach personal protective equipment (PPE).

Thermal cutting using plasma-arc requires construction of specialized containment and ventilation systems to protect workers and control dust and fumes. Installation of these systems is engineering-intensive, time consuming and expensive. Thermal cutting also creates potential toxic and corrosive hazards when the tank contains organic or halogenated organic residues.

D&D managers envisioned alternative cutting methods that would reduce workers' exposure to cutting hazards, ergonomic challenges and the potential for airborne radioactivity and beryllium contamination that result from thermal or mechanical size-reduction methods.



New Tank 40 after cutting with the ultra-high pressure water-jet.

The Technology

Jet Edge of St. Michael, Minn., proposed an ultra-high pressure, abrasive water-jet

cutting system. It uses a 50-horsepower intensifier pump to generate 55,000 psi output pressure. The pump supplies water to an abrasive cutting head that is configured on a 14-foot aluminum track to guide the cutting unit for a desired cut. Direction of cut, drive motor start and stop, travel speed and abrasive delivery rate are all controlled from a remote panel. A fluidized system delivers garnet, the abrasive material used in sandpaper, from a 400-lb hopper at up to 3 lbs. per minute. The unit is capable of cutting 1/4-inch stainless steel at a rate of 24 inches per

minute. It generates about one gallon of water per minute.

Innovative for cutting contaminated equipment, the use of water keeps contaminants suppressed. Water acts as a fixative during cutting and effectively contains contamination that mechanical and thermal means would send airborne. Safely staged at a distance, workers endure no ergonomic or physical strain and are not exposed to fall danger, confined spaces, or cutting and breaching hazards.

The Project

New Tank 40 in Building 774 measured 28 feet long with a 6.5 foot diameter. It was positioned on a series of supports about a foot above a concrete pedestal. The tank stored 1,500 gallons of contaminated sludge generated during treatment of B771's liquid waste. After removing the sludge and packaging it in 55-gallon drums, workers decontaminated the interior walls of the tank to SCO criteria for disposal. The tank was then prepared for three cuts with the water jet to create four rings that could be raised from the basement-level room through a hatch leading to the outside. The cutting unit was attached to a flexible track that was vacuum-clamped around the circumference of the tank. At the unit's cutting rate of 24 inches per minute, each of three cuts was made in about an hour after allowing for time to reposition the track. Water generated during cutting was collected in a drip pan beneath the tank and will be treated as waste.

The Results and Benefits

The cut surfaces were incredibly smooth and left little potential to breach PPE. Airborne radioactivity concentrations during cutting were below the level that requires respiratory protection. By cutting with the water jet, workers avoided the cramped environment beneath the tank, vibrations of cutting tools and exposure to increased airborne radioactivity.

Water jet cutting systems have been used for several years in the automotive, aerospace and other industries. Adapting this technology to size-reduce New Tank 40 was a new approach in plutonium facility decommissioning and has the potential for wide application at Rocky Flats. D&D managers are planning to use Jet Edge technology to size-reduce filter plenum walls in Building 771. Other Rocky Flats projects are considering its use to size-reduce numerous large, contaminated tanks located throughout the site. For more information on the New Tank 40 demonstration, call Chris Gilbreath, (303) 966-7355.



The 7,300 gallon New Tank 40 is located in a former liquid waste treatment facility. Because of its size, size-reduction in place was required.



An abrasive cutting head that delivers 55,000 psi is configured on a 14-foot aluminum track to guide the cutting unit.



Each of three cuts needed for the tank's circumference was made in approximately one hour.



A section of the tank cut using the water-jet system is removed from the building for packaging and disposal.



Technology Supporting the Path to Closure

For more information about Technology at Rocky Flats, contact David Maloney, Kaiser-Hill Company, (303) 966-7566, or Gary Huffman, DOE, Rocky Flats Field Office, (303) 966-7490

